Problem 1
Write a complete C++ program that does the following:
1. Asks the user to enter an integer \(x\) that is between 1000 and 100000 (inclusive).
2. Reads \(x\). If \(x\) is invalid, the program repeatedly asks for valid input.
3. Prints all positive values that are \(x\) or less and are divisible by 3 or by 7. There should be 6 values per line. (The last line of output may have fewer than 6 values.)

For example, if \(x\) is 1000, the program starts with printing 3 6 7 9 12 14 on the first line and 15 18 21 24 27 28 on the second line.

```cpp
#include <iostream>
using namespace std;

int main ()
{
    int x;
    cout << "Enter an integer x that is between 1000 and 100000 (inclusive): ";
    cin >> x;
    while (x < 1000 || x > 100000)
    {
        cout << "Enter an integer x that is between 1000 and 100000 (inclusive): ";
        cin >> x;
    }

    int count = 0;
    for (int i = 1; i <= x; i++)
    {
        if (i % 3 == 0 || i % 7 == 0) { cout << i << " "; count++;
        if (count == 6) { cout << endl; count = 0; }
    }
    return 0;
} //main
```

Problem 2
Write C++ statements to carry out the following tasks. Do not write complete programs, just give a single line, or a few lines of C++ instructions. Assume that the following variables have been declared, and if necessary have a value, for each part:
int i1, i2, sum;

Declare any other variables that you use.

(a) Assume \(i1\)’s value is a positive number and \(i2\)’s value is a negative number. Multiply \(i1\) and \(i2\), and then add that to \(sum\)’s value.
\[ sum += (i1 * i2); \]

(b) Print one random integer whose value is between 1000 and 1024 (inclusive). (The random integer should be determined by using an appropriate C++ function.)
\[ cout << rand () % 25 + 1000; \]

(c) Calculate and store the decimal that represents the fraction 11/14.
\[ double d = 11 / 14.0; \]
(d) Assume \( i1 \)'s value is a positive number. Set a variable called \( \text{sqRt} \) as the square root of \( i1 \) (it should be determined by using an appropriate C++ function).

\[
\text{double sqRt = sqrt (i1);}
\]

(e) Print three lines to the output screen. The first two lines should be blank, and the third line consists of the following text:

\[
\text{endl cout} \ll \text{endl} \ll \text{endl} \ll \text{endl};
\]

**Problem 3**
Consider the following C++ program. What is the output from the program in response to the user input?

```cpp
#include <iostream>
using namespace std;

int main ()
{
    int n;
    cout << "Please enter one integer: ";
    cin >> n;

    if (n < 4) cout << 0 % n << endl;
    else
    {
        if (n <= 40) for (int a = 19; a < n; a++) cout << '?';
        else { while (n <= 400) n *= 2; cout << n; }
    }
    return 0;
} //main
```

(a) The user enters: 1
0
(b) The user enters: 17
(c) The user enters: 21
??
(d) The user enters: 50
800
(e) The user enters: 51
408

**Problem 4**
Below are the first ten lines of the division table for the number 1.

0 divided by 1 is 0
1 divided by 1 is 1
2 divided by 1 is 2
3 divided by 1 is 3
4 divided by 1 is 4
5 divided by 1 is 5
6 divided by 1 is 6
7 divided by 1 is 7
8 divided by 1 is 8
9 divided by 1 is 9
In other words, the division table consists of the number 1 dividing the first ten numbers (starting from zero).

Write a complete C++ program that prints the first ten lines of the division tables for the numbers 2 through 5. Below is the exact first line (which is 0’s division table for the numbers 2 through 5) that should print. (Note the extra comma at the end of the line.)

0 divided by 2 is 0, 0 divided by 3 is 0, 0 divided by 4 is 0, 0 divided by 5 is 0,

The remaining nine lines should be the division tables for 1 through 9, for the numbers 2 through 5.

```cpp
#include <iostream>
using namespace std;

int main ()
{
    for (int r = 0; r <= 9; r++)
    {
        for (int num = 2; num <= 5; num++)
        {
            cout << r << " divided by " << num << " is ";
            cout << (r / (double) num) << ", ";
        } //for
        cout << endl;
    } //for

    return 0;
} //main
```